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D scripti n

This invention relates to a control method for automatic vehicles and more particularly, to a method of controlling starting of a vehicle.

An automatic clutch known in the art automatically controls a friction clutch of an automobile e.g., a dry-type single disk clutch, by means of an electronic control apparatus. Specifically, this type of automatic clutch automates the transmission and disengagement of motive power by a friction clutch by means of an electronic control apparatus which controls an actuator that operates in response to hydraulic, pneumatic or negative pressure. A control apparatus for an automatic clutch of this type is disclosed in the specification of Japanese Patent Publication No. 50-12648, wherein the engaged state of a clutch is gradually varied in dependence upon an increase in engine rpm, and in the specification of Japanese Patent Application Laid-Open No. 52-5117 where the rate at which a clutch is engaged is varied in accordance with engine rpm.

In a vehicle equipped with such an automatic clutch, operation is no different from that of a vehicle having an automatic transmission equipped with a torque converter. To propel the vehicle, therefore, the driver depresses the accelerator pedal a considerable amount and continues to hold the pedal depressed until a certain velocity is attained. This is because of the operating characteristic of an automatic transmission equipped with a torque converter. More specifically, with an automatic transmission having a torque converter, the engine is constantly subjected to a load of a certain magnitude in the drive range. No matter how far the accelerator pedal is depressed, the engine will not race excessively. In addition, the higher the engine rpm and the greater the slip factor, the greater the torque ratio obtained. This increases the drive torque as well as the engine braking torque thereby suppressing racing. In a vehicle equipped with the above-described automatic clutch however, the clutch engaging operation is performed after a rise in engine rpm which results in a number of inconveniences. First of all, when the clutch starts to be engaged, engine rpm rises considerably, during which time the vehicle itself is completely at rest. Therefore, (1) the engine races, (2) the amount of clutch slip sustained in a half-clutch operation becomes great owing to engine racing, thereby resulting in clutch wear and reduced clutch lifetime, and (3) fuel consumption rises as a result of (1) and (2). Secondly, after the driver depresses the accelerator pedal, a certain period of time is required before engine rpm rises. Since the clutch is controlled in accordance with the rise in engine rpm, starting response is slow. Furthermore, since the vehicle will not move forward under these conditions ven when the accelerator pedal is depressed, the driver tends to depress the pedal excessively. This not only aggravates the phenomena (1) through (3) but also increases the risk of sudden forward movement since the accelerator pedal will be in a considerably depressed state and the engine rpm high when the vehicle starts moving. In particular, problems are encountered when attempting to move the vehicle a slight amount at low speed, as when parking an automobile in a garage or close to a curb.

In the conventional clutch control system, a relevant proportional constant (constant of proportionality) may be set so that the clutch engaging operation takes place comparatively slowly in order to realize a smooth start and minimize both sudden forward movement and shock when movement starts. As a result of this setting of the proportional constant, however, clutch control is performed slowly in gear shifting following the starting of the vehicle, thereby lengthening the time for shifting and making it difficult to achieve smooth acceleration after the gear change. In addition, a shock is experienced when engine rpm undergoes a sudden change. When the proportional constant is set to a value suitable for gear shifting, on the other hand, problems in control are encountered when starting the vehicle from rest.

As regards engine fuel supply means e.g., a throttle valve in a gasoline engine or a fuel injection pump in a diesel engine certain problems are encountered because such means are controlled independently f the clutch. Specifically where the accelerator pedal is depressed to accelerate the vehicle from a state in which the clutch is disengaged when the vehicle is started or travelling at low speed the clutch is controlled comparatively slowly to avoid shock and realize smooth acceleration, as explained above. On the other hand, in, say, a gasoline engine, a throttle valve for controlling the amount of fuel and air supplied to the engine has its opening controlled, independently of the clutch, in accordance with the amount of accelerator pedal depression, to increase the fuel and air supply and raise the engine rpm.

Until the clutch becomes fully engaged, therefore, the engine races and the driver experiences an unpleasant sensation. At the same time, the engine rpm and the vehicle speed are not linearly related (1:1) until the clutch is fully engaged. This makes it very difficult for the driver to correctly operate the accelerator when starting the vehicle from rest. In addition since the clutch is caused to slip while the engine is rotating at high speed, drawbacks are encountered of increased fuel consumption and clutch wear.

A known electronic control apparatus for controlling a clutch having the features of the precharacterising part of the accompanying claim 1, is disclosed in DE-A-3004930.

The present invention provides a control method for starting a vehicle, whereby engine racing is prevented when the vehicle is started from rest. Clutch

wear and a decline in fuel economy, which accompany engine racing, during half-clutch operation, are reduced.

The present invention provides a control method for starting a vehicle, in which sudden forward movement of the vehicle is prevented by dividing clutch control at the time the vehicle is started from rest into a very low speed control mode and an ordinary starting mode selected depending upon the amount by which the accelerator pedal is depressed so that the vehicle can be controlled with accuracy in cases where the vehicle is moved in small increments at very slow speed, as when parking in a garage or close to a curb.

The present invention also provides a fuel control method capable of preventing engine racing when a clutch is controlled.

According to the present invention, there is provided a method and a control system of controlling starting of a vehicle according to claim 1 and 4 respectively.

Reference is made by way of example, to the accompanying drawings in which:

Fig. 1 is a block diagram illustrating the construction of an engine and clutch control apparatus suitable for the application of embodiments of the present invention;

Fig. 2 is a flowchart illustrating how control is performed in accordance with a vehicle starting control method according to an embodiment of the present invention;

Figs. 3(a) to 3(h) are graphs illustrating the control method indicated by the flowchart of Fig. 2.

Fig. 1 shows a vehicle engine, clutch and a control apparatus for controlling the engine and clutch according to an embodiment of the present invention. An engine 2 is provided with a sensor 2a for sensing the rpm of the engine (e.g., engine shaft rotation speed). A throttle actuator 3 comprising a step motor or the like controls fuel supply means of the engine 1. A clutch 4 is provided for connecting and disconnecting motive force transmitted from the engine 2 to a transmission 5. A clutch actuator 6 for actuating the clutch 4 is equipped with a clutch position sensor 6a for sensing the amount of engagement of the clutch 4. A solenoid valve 7 is arranged in a hydraulic circuit of a hydraulic mechanism 8 for operating the clutch actuator 6 and comprises a hydraulic pump 8a and a reserve tank 8b. The solenoid valve 7 is adapted to control the hydraulic pressure acting upon the clutch actuator 6 thereby controlling also the speed at which the clutch actuator 6 operates. Numeral 9 denotes an accelerator pedal having an accelerator sensor 9a for sensing the amount of accelerator pedal operation. An electronic control apparatus 10 constituted by a microcomputer functions to control the clutch actuator 6 and throttle actuator 3 on the basis of output signals from the engine rotation sensor 2a, the clutch position sensor 6a, the accelerator pedal sensor 9a, a gear position sensor 5a for sensing the gear position of the transmission 5, and a vehicle speed sensor 53a.

In operation, the electronic control apparatus 10 receives an input from the accelerator pedal sensor 9a indicative of the amount of depression of the accelerator pedal 9, an input from the clutch position sensor 6a indicative of the amount of clutch engagement, and an input from the engine rotation sensor 2a indicative of the rpm of engine 2. On the basis of these input signals, the electronic control apparatus 10 controls the throttle actuator 3 and the solenoid valve 7 for operating the clutch actuator 6 thereby controlling the fuel supply means and the clutch.

A control method according to an embodiment of the present invention will now be described in detail in conjunction with the flowchart of Fig. 2 and the several views of Fig. 3 illustrating how control is performed.

In step 1 of the flowchart, the electronic control apparatus 10 reads in and stores an amount of clutch engagement CLT from the clutch position sensor 6a. In steps 2, 3 and 4, the electronic control apparatus 10 reads in engine rpm ENG from the engine rotation sensor 2a, stores ENG in memory, finds the change in engine rpm and stores the change in memory. Next, in a step 5, the control apparatus 10 reads in an amount of accelerator pedal depression ACC from the accelerator sensor 9a and stores ACC in memory. The electronic control apparatus 10 then performs a comparison (step 6) to determine whether or not ACC is zero. If ACC is non-zero, the program moves to a step 7, in which the control apparatus 10 determines whether ACC is greater than a set value a for mode changeover. If it is determined here that ACC is less (not greater) than the set value a then the electronic control apparatus 10 executes a step 8, in which a clutch control target position CLT:COM is set to a half-clutch range on the basis of previously stored map data shown in Fig. 3(a). Next, in a step 9, the electronic control apparatus varies the clutch operating speed CLT:SPD on the basis of previously stored map data shown in Fig. 3(b), with a position b at which the half-clutch region starts serving as a boundary. CLT:SPD is decided by the amount of clutch engagement. Then until the set value a for mode changeover is reached, the electronic control apparatus 10 executes a step 10 to set a throttle target opening THR:COM on the basis of previously stored map data shown in Fig. 3(c), so as to follow a curve corresponding to engine performance. Thus, control of the throttle opening is non-linear. The program then moves to a step 11, where the electronic control apparatus 10 performs a comparison operation to determine whether the amount of actual clutch engagement CLT, obtained from the clutchstroke sensor 6a, is less than the clutch control target position CLT:COM. If the result of the determination is affirmative, (CLT is less

than CLT:COM), the program moves to a throttle control step (13). If the result is negative then the clutch actuator 6 is operated at the clutch operating speed CLT:SPD. This is step 12 of the flowchart. This is followed by execution of a step 13, in which th electronic control apparatus 10 performs a comparison to determine whether the actual throttle opening THR is equal to the throttle target opening THR:COM. If it is not, the control apparatus 10 executes a step 14 in which the magnitude of the actual throttle opening THR is compared with that of the throttle target opening THR:COM. If the actual throttle opening THR is greater than the throttle target opening THR:COM then the throttle actuator 3 is moved toward the closing side (step 15). If THR is smaller (not greater) than THR:COM, the throttle actuator is moved toward the opening side (step 16).

If it is determined at step 7 that the amount of depression of the accelerator pedal 1 is greater than the set value a for mode changeover, the electronic control apparatus 10 compares, in a step 17, the engine rpm ENG with a comparative engine rpm value obtained based on an amount of clutch engagement from previously stored map data shown in Fig. 3(d). If the engine rpm ENG is greater than the comparative value, the electronic control apparatus 10 executes a step 18. Here, based on previously stored map data illustrated in Fig. 3(e) the control apparatus finds a clutch operating speed CLT:SPD which exceeds the set value a for mode changeover owing to the amount of accelerator pedal depression ACC, controls the engaging speed of the clutch actuator in such a manner that the operating speed increases with the amount of accelerator pedal depression, finds, from previously stored map data shown in Fig. 3(f), a clutch operating speed correction coefficient F6 for the amount of clutch engagement CLT, finds, from previously stored map data shown in Fig. 3(g) a clutch operating speed CLT:SPD correction term for a change in engine rpm ENG and multiplies these together to correct the clutch operating speed CLT:SPD. If the engine rpm ENG is less than the engine rpm comparative value in accordance with Fig. 3(d) the relation CLT = SPD is deemed to hold and the clutch is locked at the half-clutch position which prevails at that time (step 19). Next, in a step 20, the electronic control apparatus 10 finds an accelerator correction term for the amount of clutch engagement from the amount of accelerator depression ACC and previously stored map data shown in Fig. 3(h), thereby correcting the (value for the) amount of actual accelerator depression ACC to decide the thrott target opening THR:COM. This is followed by execution of step 11 in which the electronic control apparatus 10 performs a comparison to determine whether or not the amount of actual clutch engagement CLT is less than the clutch control target position CLT:COM, and this is followed by execution of steps among 12 to 16 as appropriate. The value of the amount of clutch engagement CLT and of the clutch control target position CLT:COM are large on the disengaged side and small on the engaged side.

Thus a comparison is performed to determine whether the amount of depression of accelerator pedal 9 is greater or less (not greater) than the set value a. If it is less the clutch control target position CLT:COM is locked in the half-clutch range [Fig. 3(a)], and the clutch operating speed CLT:SPD is decided by the amount of clutch engagement [Fig. 3(b)]. The target opening THR:COM of the throttle, rather than being controlled linearly with respect to the amount of depression of the accelerator pedal 9 is regulated in such a manner as to follow a curve corresponding to engine performance [Fig 3(c)].

If the amount of accelerator depression is greater than the set value on the other hand the engine rpm ENG and the engine rpm comparative value [Fig. 3(d)] with respect to the amount of clutch engagement CLT are compared. If the engine rpm ENG is greater than (or equal to) the comparative value, then the engaging speed of the clutch actuator is decided by the amount of accelerator depression ACC [Fig. 3(e)], the engaging speed of the clutch actuator is corrected in accordance with the amount of clutch engagement [Fig. 3(f)], and the engaging speed of the clutch actuator is corrected based on the change in engine rpm (Fig. 3(g)]. However if the value of engine rpm is found to be less than the comparative value of engine rpm with respect to the amount of clutch engagement upon comparing the two, the engaging action of the clutch actuator is halted. This is followed by calculating the throttle opening from the amount of depression of th accelerator pedal 1 and from the amount of clutch engagement [Fig. 3(h)].

Thus, the throttle is controlled independently of the amount of accelerator pedal depression until the clutch is fully engaged, and a changeover is effected between two control modes depending upon the amount of accelerator pedal depression. In other words, when the amount of accelerator pedal depression is less than a set value a very low speed control mode is established in which the clutch control target position is locked in the half-clutch range, and in which the degree of half clutch and the throttle opening (and hence the amount of fuel supplied) are decided based on the amount of accelerator pedal depression. When the amount of accelerator pedal depression is greater than the set value, however, an ordinary start mode is established in which the clutch is fully engaged the clutch actuation speed is decided based on the amount of accelerator pedal depression, and the throttle opening is calculat d based on the amount of accelerator depression and on the amount of clutch engagement.

When exercising control to start a vehicle from rest, the vehicle engine and a clutch are controlled in

a very low speed control mode if the amount by which an accelerator pedal is depressed is less than a set value. If the amount of accelerator pedal depression is greater than the set value, the engine and clutch are controlled in an ordinary start control mode.

Claims

1. A method of controlling starting of a vehicle equipped with an accelerator pedal sensor (9a) for sensing an amount of depression of an accelerator pedal (9), a throttle actuator (3) for controlling an amount of opening of a throttle, an engine rotation sensor (2a) for sensing rpm of an engine (2), a clutch actuator (6) for controlling an amount of engagement of a clutch (4), a clutch stroke sensor (6a) for sensing engagement of the clutch (4), and an electronic control apparatus (10) which receives detection signals from each of said sensors (9a, 2a, 6a) for controlling the throttle.actuator (3) and the clutch actuator (6) based on the detection signals, the method including the steps of:-

    (a) sensing the amount of depression of the accelerator pedal (9) by the accelerator pedal sensor (9a),

    (b) performing a comparison to determine whether the amount of accelerator pedal depression is greater than or less than a set value, and

    (c) selecting a start control mode depending upon the amount of accelerator pedal depression and controlling the throttle actuator (3) and the clutch actuator (6) accordingly;

    characterised in that the amount of engagement of the clutch (4) is sensed by the clutch stroke sensor (6a), and in that step (c) comprises:-

    when the amount of accelerator pedal depression is less than the set value, selecting a very low speed control mode in which the clutch is actuated by the clutch actuator (6) to a final amount of engagement in a halfclutch range, that final amount of engagement and a throttle target opening being decided by the electronic control apparatus based on the amount of accelerator pedal depression; and

    when the amount of accelerator pedal depression is greater than the set value, selecting an ordinary start mode in which the clutch is actuated by the clutch actuator (6) towards full engagement at a speed decided based on the amount of accelerator pedal depression, and th throttle target opening is calculat d based on the amount of accelerator pedal depression and the current amount of clutch engagement.

2. A method according to claim 1, wherein in the ordinary start mode, the engagement operating speed of the clutch actuator (6) is corrected by the current amount of clutch engagement and a change in engine rpm.

3. A method according to claim 1 or 2, wherein in the ordinary start mode, the engine rpm sensed by the engine rotation sensor (2a) is compared with a comparative value of engine rpm based on the current amount of clutch engagement, and operation of the clutch actuator (6) is halted when the sensed engine rpm is less than the comparative value of engine rpm.

4. A control system for controlling the starting of a vehicle equipped with an accelerator pedal sensor (9a) for sensing an amount of depression of an accelerator pedal (9), a throttle actuator (3) for controlling an amount of opening of a throttle, an engine rotation sensor (2a) for sensing rpm of an engine (2), a clutch actuator (6) for controlling an amount of engagement of a clutch (4), a clutch stroke sensor (6a) for sensing engagement of the clutch (4), and an electronic control apparatus (10) which receives detection signals from each of said sensors (9a, 2a, 6a) for controlling the throttle actuator (3) and the clutch actuator (6) based on the detection signals, the wsystem comprising means for carrying out the steps of:-

    (a) sensing the amount of depression of the accelerator pedal (9) by the accelerator pedal sensor (9a),

    (b) performing a comparison to determine whether the amount of accelerator pedal depression is greater than or less than a set value, and

    (c) selecting a start control mode depending upon the amount of accelerator pedal depression and controlling the throttle actuator (3) and the clutch actuator (6) accordingly;

    characterised in that the clutch stroke sensor (6a) is operable to sense the amount of engagement of the clutch (4), and in that said means for carrying out step (c) is operable as follows:-

    when the amount of accelerator pedal depression is less than the set value, a very low speed control mode is selected in which the clutch is-actuated by the clutch actuator (6) to a final amount of engagement in a halfclutch range, that final amount of engagement and a throttl target opening being decided based on the amount of accelerator pedal depression; and

    when the amount of accelerator pedal depression is greater than the set value, an ordinary start mode is selected in which the clutch is actuated by the clutch actuator (6) towards full

engagement at a speed decided based on the amount of accelerator pedal depression, and the throttle target opening is calculated based on the amount of accelerator pedal depression and the current amount of clutch engagement.

5. An electronic control system according to claim 4, wherein in the ordinary start mode, the engagement operating speed of the clutch actuator (6) is corrected by the current amount of clutch engagement and a change in engine rpm.

6. An electronic control system according to claim 4 or 5, wherein in the ordinary start mode, the engine rpm sensed by the engine rotation sensor (2a) is compared with a comparative value of engine rpm based on the amount of clutch engagement, and operation of the clutch actuator (6) is halted when the sensed engine rpm is less than the comparative value of engine rpm.

Patentansprüche

1. Verfahren zur Anfahrsteuerung eines Fahrzeuges mit einem Gaspedalsenor (9a) zur Erfassung des Gaspedalweges, um den das Gaspedal (9) niedergedrückt ist, einem Drosselklappenstellorgan (3) zur Steuerung des Öffnungsbetrages der Drosselklappe, einem Motordrehzahlsensor (2a) zur Erfassung der Drehzahl einer Maschine (2), einem Kupplungsbetätigungsorgan (6) zur Steuerung des Eingriffsgrades der Fahrzeugkupplung (4), einem Kupplungshubsensor (6a) zur Erfassung des Eingriffsgrades der Kupplung (4), und einer elektronischen Steuerungsanordnung (10), die von jedem der genannten Sensoren (9a, 2a, 6a) Detektorsignale aufnimmt, um das Drosselklappenstellorgan (3) und das Kupplungsbetätigungsorgan (6) auf der Basis dieser Detektorsignale zu steuern, wobei das Verfahren folgende Schritte umfaßt:

(a) Erfassen des Wertes des Gaspedalweges, um den das Gaspedal (9) niedergedrückt ist, durch den Gaspedalsensor (9a),
(b) Durchführung eines Vergleichs, um festzustellen, ob der Gaspedalweg größer oder kleiner ist als ein Sollwert,
(c) Auswahl eines Anfahrsteuerungsmodus in Abhängigkeit vom Gaspedalweg und Steuerung des Drosselklappenbetätigungsorgans (3) und des Kupplungsbetätigungsorgans (6),

dadurch gekennzeichnet, daß der Eingriffsgrad der Kupplung (4) durch d n Kupplungshubsensor (6a) erfaßt wird, und daß Schritt (c) folgendes umfaßt:
wenn der Betrag des Gaspedalweges kleiner als der Sollwert ist, wird ein sehr niedriger Geschwindigkeitssteuerungsmodus ausgewählt, bei welchem die Kupplung durch das Kupplungsbetätigungsorgan (6) zu einem Endbetrag des Eingriffsgrades in einen Halbkupplungsbereich bewegt wird, so daß der Endbetrag des Eingriffsgrades und die Drosselklappenöffnung durch die elektronische Steuerungseinrichtung auf der Basis des Betrags des Gaspedalweges bestimmt werden, um den das Gaspedal niedergedrückt ist; und
wenn der Gaspedalweg größer als der Sollwert ist, wird ein normaler Anfahrmodus ausgewählt, bei dem die Kupplung durch das Kupplungsbetätigungsorgan (6) in einen vollen Eingriff gesteuert wird bei einer bestimmten Geschwindigkeit, die auf dem Betrag basiert, um den das Gaspedal niedergedrückt ist, und die Öffnung der Drosselklappe wird auf der Basis des Wertes des Gaspedals, um den es niedergedrückt ist, und des Kupplungseingriffsgrades berechnet.

2. Verfahren nach Anspruch 1, wobei beim normalen Anfahrmodus die Eingriffsarbeitsgeschwindigkeit des Kupplungsbetätigungsorgans (6) durch den Eingriffsgrad der Kupplung und der Änderung der Motordrehzahl korrigiert wird.

3. Verfahren nach Anspruch 1 oder 2, wobei beim normalen Anfahrmodus die Motordrehzahl, die durch einen Motordrehzahlmesser (2a) erfaßt wird, mit einem Drehzahlvergleichswert verglichen wird, der auf dem Eingriffsgrad der Kupplung basiert, und wobei der Arbeitsvorgang des Kupplungsbetätigungsorgans (6) angehalten wird, wenn die erfaßte Motordrehzahl niedriger ist als der vergleichbare Wert der Motordrehzahl.

4. Steuerungssystem zur Anfahrsteuerung eines Fahrzeuges mit einem Gaspedalsensor (9a) zur Erfassung des Wertes eines Gaspedalweges, um den es niedergedrückt ist, einem Drosselklappenbetätigungsorgan (3) zur Steuerung des Öffnungsgrades der Drosselklappe, einem Motordrehzahlsensor (2a) zur Erfassung der Drehzahl eines Motors (2), einem Kupplungsbetätigunsorgan (6) zur Steuerung des Eingriffsgrades der Fahrzeugkupplung (4), einem Kupplungshubsensor (6a) zur Erfassung des Eingriffsgrades der Kupplung (4), und einer elektronischen Steuerungsanordnung (10), die von jedem der genannten Sensoren (9a, 2a, 6a) Detektorsignale aufnimmt, um das Drosselklappenbetätigungsorgan (3) und das Kupplungsbetätigungsorgan (6) auf der Basis dieser Detektorsignale zu steuern, wobei das System Mittel zur Ausführung folgende Schritte umfaßt:

(a) Erfassen des Wertes des Gaspedalwegs, um den es niedergedrückt ist, durch den Gaspedalsensor (9a),

(b) Durchführung eines Vergleichs, um festzustellen, ob der Gaspedalweg größer ist oder kleiner als ein Sollwert,

(c) Auswahl eines Anfahrsteuerungsmodus in Abhängigkeit vom Gaspedalweg sowie Steuern des Drosselklappenbetätigungsorgans (3) und des Kupplungsbetätigungsarms (6),

dadurch gekennzeichnet, daß der Kupplungshubsensor (6a) fähig ist, den Eingriffsgrad der Kupplung (4) zu erfassen, und bei dem die Mittel zur Ausführung des Schritts (c) wie folgt arbeiten:

wenn der Betrag des Gaspedalweges kleiner als der Sollwert ist, wird ein sehr niedriger Geschwindigkeitssteuerungsmodus ausgewählt, bei welchem die Kupplung durch das Kupplungsbetätigungsorgan (6) zu einem Endbetrag des Eingriffsgrades in einen Halbkupplungsbereich bewegt wird, so daß der Endbetrag des Eingriffsgrades und die Drosselklappenöffnung durch die elektronische Steuerungseinrichtung auf der Basis des Gaspedalweges bestimmt werden; und

wenn der Gaspedalweg größer als der Sollwert ist, wird ein normaler Anfahrmodus ausgewählt, bei dem die Kupplung durch das Kupplungsbetätigungsorgan (6) in einen vollen Eingriff gesteuert wird bei einer Geschwindigkeit, die auf dem Betrag basiert, um den das Gaspedal niedergedrückt ist, und die Öffnung der Drosselklappe wird auf der Basis des Wertes des Gaspedals, um den es niedergedrückt ist, und des Kupplungseingriffsgrades berechnet.

5. Elekronisches Steuerungssystem nach Anspruch 4, wobei im normalen Anfahrmodus die Eingriffsarbeitsgeschwindigkeit des Kupplungsbetätigungsorgans (6) durch den Eingriffsgrad der Kupplung und die Änderung der Motordrehzahl korrigiert wird.

6. Elektronisches Steuerungssystem nach Anspruch 4 oder 5, bei dem beim normalen Anfahrmodus die Motordrehzahl, die durch einen Motordrehzahlmesser (2a) erfaßt wird, mit einem Motordrehzahlvergleichswertverglichen wird, basierend auf dem Eingriffsgrad der Kupplung, und bei dem die Einrückfunktion des Kupplungsbetätigunsorgans (6) angehalten wird, wenn die erfaßte Motordrehzahl kleiner ist als der Motordrehzahlvergleichswert.

R v ndicati ns

1. Un procédé d commande du démarrag d'un véhicule équipé d'un détecteur de pédale d'accélérateur (9a) pour détecter une amplitude d'enfoncement d'une pédale d'accélérateur (9), d'un actionneur de papillon (3) pour commander l'amplitude d'ouverture d'un papillon, d'un détecteur de rotation de moteur (2a) pour détecter la vitesse de rotation d'un moteur (2), d'un actionneur d'embrayage (6) pour commander l'amplitude de mise en prise d'un embrayage (4), d'un détecteur de course d'embrayage (6a) pour détecter la mise en prise de l'embrayage (4), et d'un appareil électronique de commande (10) qui reçoit les signaux de détection de chacun desdits détecteurs (9a, 2a, 6a) pour commander l'actionneur de papillon (3) et l'actionneur d'embrayage (6) en fonction des signaux de détection, le procédé comprenant les opérations de :

(a) détection de l'amplitude d'enfoncement de la pédale d'accélérateur (9) par le détecteur de pédale d'accélérateur (9a),

(b) exécution d'une comparaison pour déterminer ai l'amplitude d'enfoncement de la pédale d'accélérateur est supérieure ou inférieure à une valeur fixée, et

(c) sélection d'un mode de commande de démarrage en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur, et commande correspondante de l'actionneur de papillon (3) et de l'actionneur d'embrayage (6) :

caractérisé en ce que l'amplitude de mise en prise de l'embrayage (4) est détectée par le détecteur de course d'embrayage (6a), et en ce que l'opération (c) comprend :

lorsque l'amplitude d'enfoncement de la pédale d'accélérateur est inférieure à la valeur fixée, la sélection d'un mode de commande à très basse vitesse dans lequel l'embrayage est actionné par l'actionneur d'embrayage (6) à une amplitude de mise en prise finale dans une gamme de demi-embrayage, cette amplitude finale de mise en prise et une ouverture recherchée du papillon étant déterminées par l'appareil de commande électronique en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur ; et

lorsque l'amplitude d'enfoncement de la pédale d'accélérateur est supérieure à la valeur fixée, la sélection d'un mode de démarrage normal dans lequel l'embrayage est actionné par l'actionneur d'embrayage (6) en direction de la mise en prise complète à une vitesse déterminée en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur, l'ouverture recherchée du papillon étant calculée en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur t d l'amplitude actuell de mise en prise de l'embrayage.

2. Un procédé selon la revendication 1, dans lequel, dans le mode de démarrag n rmal, la vitesse d'actionnem nt en mise en prise d l'actionneur d'embrayage (6) est corrigée par l'amplitude

actuelle de mise en prise de l'embrayage et un changement dans la vitesse de rotation du moteur.

3. Un procédé suivant la revendication 1 ou 2, dans lequel, dans le mode de démarrage normal, la vitesse de rotation du moteur détectée par le détecteur de rotation du moteur (2a) est comparée avec une valeur de comparaison de la vitesse de rotation du moteur en fonction de l'amplitude actuelle de mise en prise de l'embrayage, le fonctionnement de l'actionneur d'embrayage (6) étant arrêté lorsque la vitesse détectée de rotation du moteur est inférieure à la valeur de comparaison de la vitesse de rotation du moteur.

4. Un système de commande permettant de contrôler le démarrage d'un véhicule équipé d'un détecteur de pédale d'accélérateur (9a) pour détecter une amplitude d'enfoncement d'une pédale d'accélérateur (9), d'un actionneur de papillon (3) pour commander l'amplitude d'ouverture d'un papillon, d'un détecteur de rotation de moteur (2a) pour détecteur la vitesse de rotation d'un moteur (2), d'un actionneur d'embrayage (6) pour commander l'amplitude de mise en prise d'un embrayage (4), d'un détecteur de course d'embrayage (6a) pour détecter la mise en prise de l'embrayage (4), et d'un appareil électronique de commande (10) qui reçoit les signaux de détection de chacun desdits détecteurs (9a, 2a, 6a) pour commander l'actionneur de papillon (3) et l'actionneur d'embrayage (6) en fonction des signaux de détection, le système comprenant des moyens pour mettre en oeuvre les opérations de :

(a) détection de l'amplitude d'enfoncement de la pédale d'accélérateur (9) par le détecteur de pédale d'accélérateur (9a),
(b) exécution d'une comparaison pour déterminer ai l'amplitude d'enfoncement de la pédale d'accélérateur est supérieure ou inférieure à une valeur fixée, et
(c) sélection d'un mode de commande de démarrage en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur, et commande correspondante de l'actionneur de papillon (3) et de l'actionneur d'embrayage (6) ;

caractérisé en ce que le détecteur d'embrayage (6a) est actionnable pour détecter l'amplitude de mise en pris de l'embrayage (4), et en ce que lesdits moyens pour mettre en oeuvre l'opération (c) sont actionnables comme suit :
lorsque l'amplitude d'enfoncement de la pédale d'accélérateur est inférieure à la valeur fixée, on choisit un mode de commande à très basse vit sse dans lequel l'embrayage st actionné par l'actionneur d'embrayage (6) à une amplitude de mis en prise finale dans une gamme de demi-embrayage, cette amplitude finale de mise en prise et une ouverture recherchée du papillon étant déterminées par l'appareil de commande électronique en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur ; et
lorsque l'amplitude d'enfoncement de la pédale d'accélérateur est supérieure à la valeur fixée, on choisit un mode de démarrage normal dans lequel l'embrayage est actionné par l'actionneur d'embrayage (6) en direction de la mise en prise complète à une vitesse déterminée en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur, l'ouverture recherchée du papillon étant calculée en fonction de l'amplitude d'enfoncement de la pédale d'accélérateur et de l'amplitude actuelle de mise en prise de l'embrayage.

5. Un système de commande électronique selon la revendication 4, dans lequel, dans le mode de démarrage normal, la vitesse d'actionnement de mise en prise de l'actionneur d'embrayage (6) est corrigée par l'amplitude actuelle de mise en prise de l'embrayage et un changement dans la vitesse de rotation du moteur.

6. Un système de commande électronique selon la revendication 4 ou 5, dans lequel, dans le mode de démarrage normal, la vitesse de rotation du moteur détectée par le détecteur de rotation de moteur (2a) est comparée avec une valeur de comparaison de la vitesse de rotation du moteur en fonction de l'amplitude de mise en prise de l'embrayage, Le fonctionnement de l'actionneur d'embrayage (6) étant arrêté lorsque la vitesse détectée de rotation du moteur est inférieure à la valeur de comparaison de la vitesse de rotation du moteur.

Fig. 1

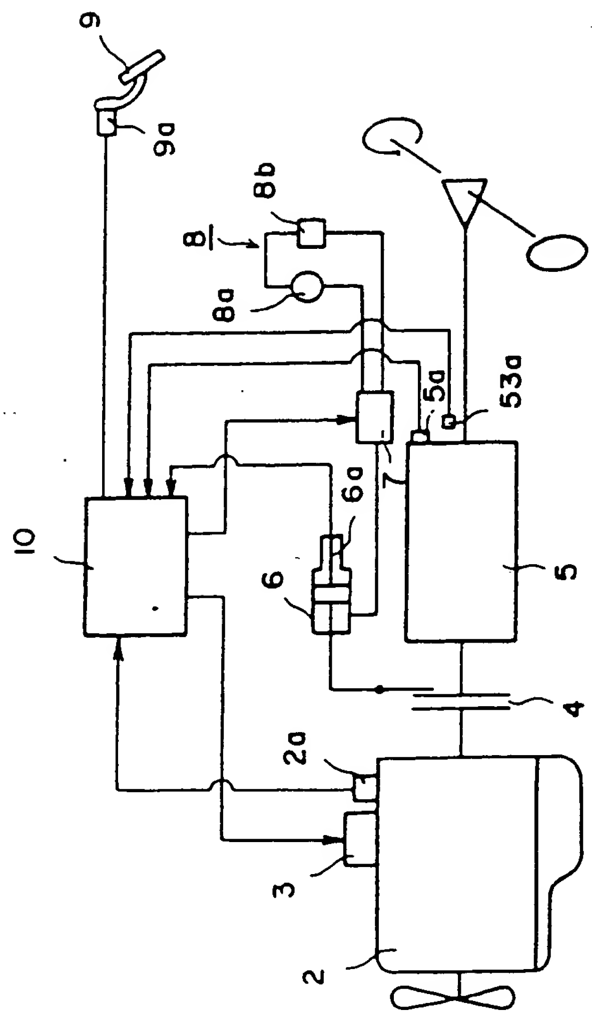


Fig. 2

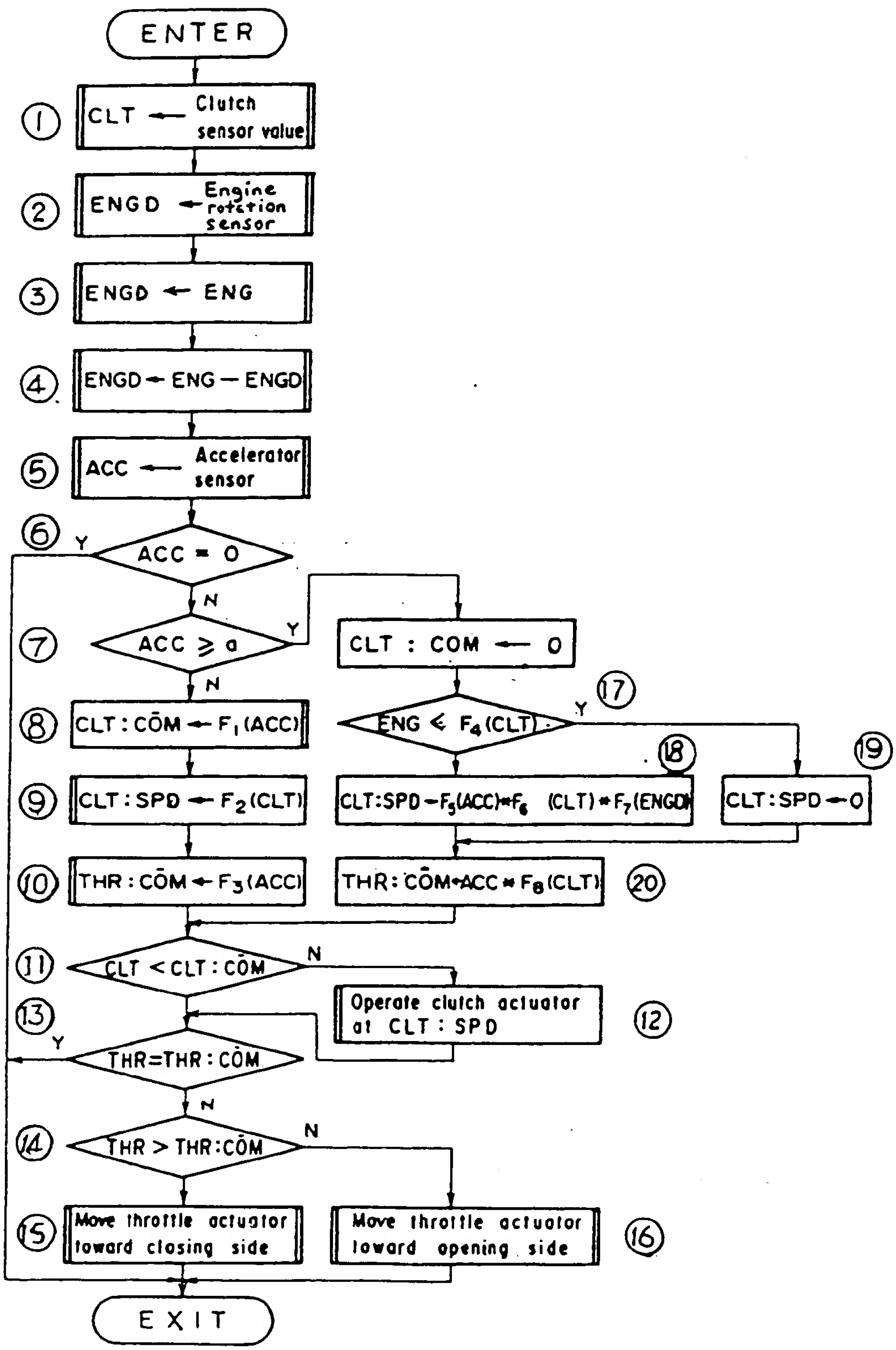

ENTER
CLT ← Clutch sensor value
ENGD ← Engine rotation sensor
ENGD ← ENG
ENGD ← ENG − ENGD
ACC ← Accelerator sensor
ACC = 0
ACC ≥ a
CLT : COM ← 0
CLT : COM ← F1 (ACC)
ENG ≤ F4 (CLT)
CLT : SPD ← F2 (CLT)
CLT:SPD ← F5(ACC) * F6 (CLT) * F7 (ENGD)
CLT : SPD ← 0
THR : COM ← F3 (ACC)
THR : COM ← ACC * F8 (CLT)
CLT < CLT : COM
Operate clutch actuator at CLT : SPD
THR = THR : COM
THR > THR : COM
Move throttle actuator toward closing side
Move throttle actuator toward opening side
EXIT

Fig. 3 (a)

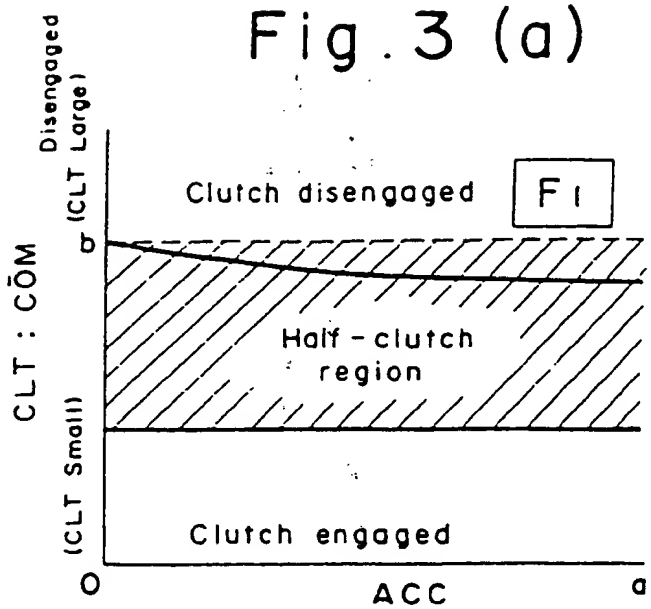


Fig. 3 (b)

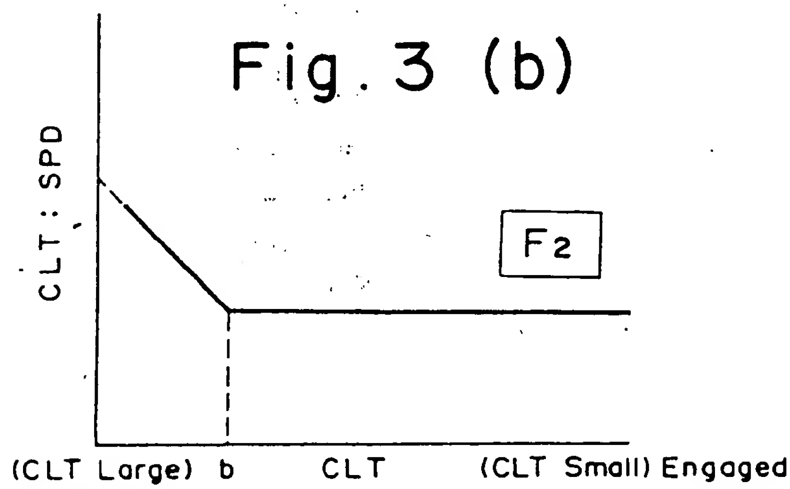


Fig. 3 (c)

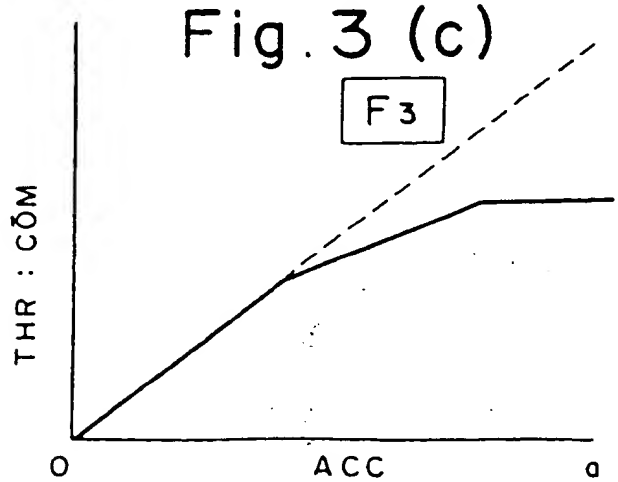


Fig. 3 (d)

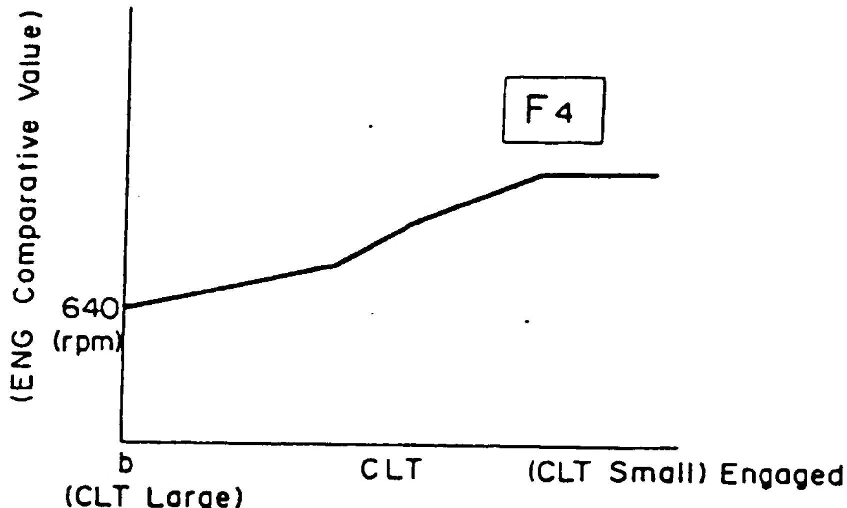


Fig. 3 (e)

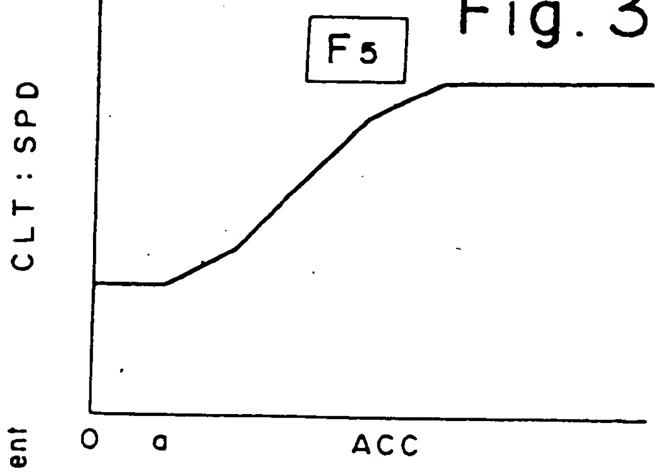


Fig. 3 (f)

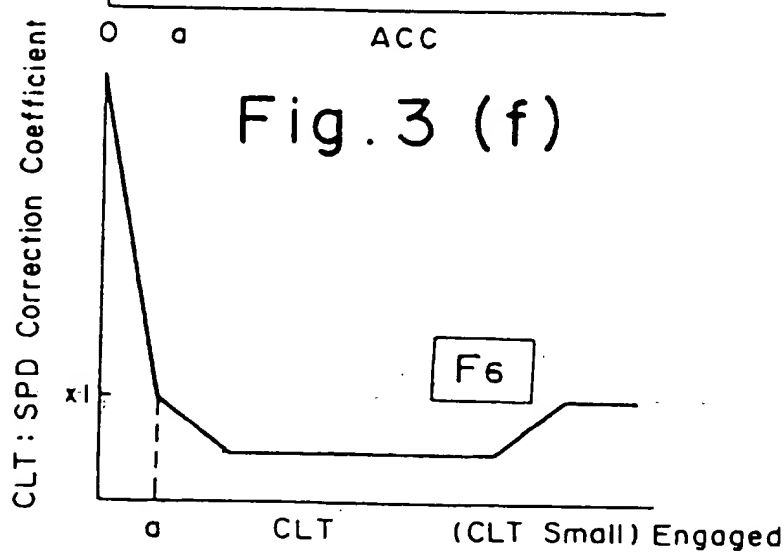


Fig. 3 (g)

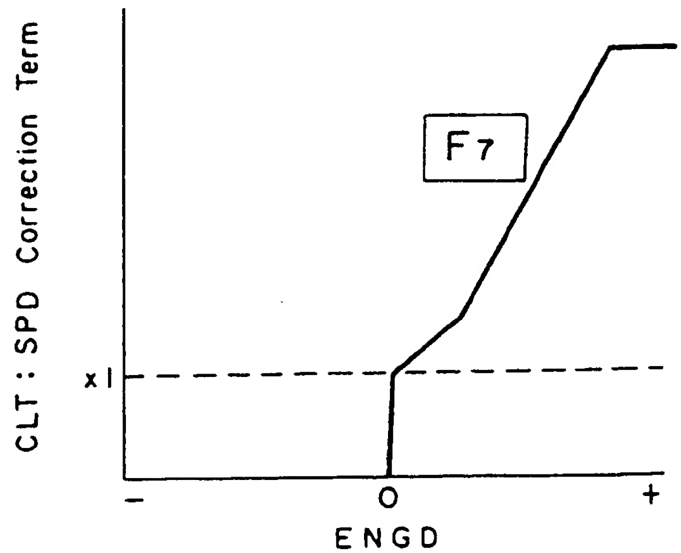
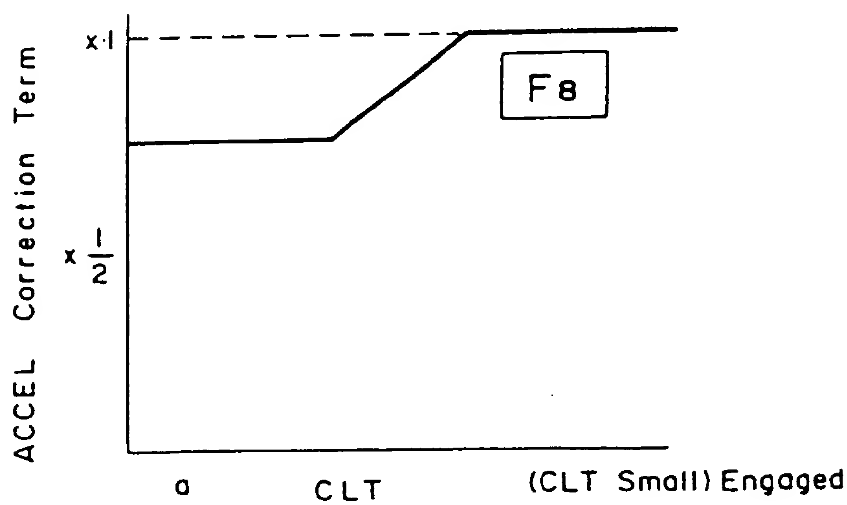

CLT : SPD Correction Term
x 1
F7
−
0
+
ENGD

Fig. 3 (h)


ACCEL Correction Term
x·1
x 1/2
F8
a
CLT
(CLT Small) Engaged